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SOME EARLY ASTRONOMICAL SITES IN KASHMIR (INDIA)

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Abstract: We analyze a number of early rock art sites in the Kashmir Valley and suggest that some of these depict astronomical objects or events. All of the sites are in the Srinagar and Sopore regions and date to Neolithic or Upper Paleolithic times. Our studies suggestl that during this period some of the ancient astronomers recorded supernovae meteorite impacts, the Sun, the Moon and the seasons in their rock art.

Key words: Ancient astronomy; stone carvings; supernovae; meteorite impacts

1 INTRODUCTION

Archaeoastronomy is the study of ancient or traditional astronomies in their cultural context, utilizing archaeological and/or anthropological evidence. The subject uses historical records of heavenly events to infer the astronomical knowledge of our ancestors. Archaeoastronomy also uses monuments and written records to evaluate astronomical traditions. The importance of archaeoastronomy is that it allows us to understand something about prehistoric times and the knowledge of astronomy that flourished. In other words, archaeoastronomy can be used to identify prehistoric astronomical practices. There are a number of ways of studying archaeoastronomy, including through

1) the architecture of ancient monuments (e.g. see Menon and Vahia, 2006);
2) simulations of ancient observatories and situations (e.g. see Hrishikesh et al., 2006);
3) Harappan script pattern recognition (e.g. see Nisha and Vahia, 2006); and
4) stone carvings (e.g. see Masood et al., 2006).

The Kashmir region of India is rich in stone carvings. Stone carvings often have abstract representations, and large numbers of poorly-understood stone car-vings create interesting questions about the history of civilization. These mysteries pose important questions and lead to new answers about the people of the ancient world, including their culture, language, architecture, astronomy and religion. Ancient people viewed heavenly objects as unknowns and sometimes expressed their state of knowledge through their stone carvings. The first astronomical carvings were discovered in the area of Jiepmaluokta, about 4 km from the centre of the town of Alta. The most mysterious of the carvings were a set of geometric symbols, consisting of circular objects surrounded by fringes; others showed intricate patterns of horizontal and vertical lines (see Stemersen and Liback, 2003).

Various carvings found in Kashmir and in the areas of Dras (Ladakh) and Chills (on the border of Ladakh in the Pakistan side) indicate that there was a tradition of recording astronomical events in prehistoric times. In this paper, we discuss sites in three different areas of Kasmir that appear to present evidence of this type.

2 ANCIENT ASTRONOMICAL ROCK ART SITES

On the basis of visiting various sites and studying their astronomical aspects we believe that the following sites were used by ancient peoples from time to time for astronomical observations and are the oldest 'observatories' in Kashmir.

2.1 Bomai Sopore (Baramulla-Kashmir)

In northern Kashmir there is a place called Bomai Sopore ~70km north-west of Srinagar. This region was occupied during the Upper Paleolithic period, from ~ 20,000 to 6,000 BP. There is a conspicuous rock carving in this area situated at $74^{\circ}30'$ longitude and $+34^{\circ}22'$ latitude, at the north-west end a 3000m high plateau with peaks to the south-east rising to ~3,500m. The rock surface has multiple concentric circles (Figures 2a and 2b), and is situated on the side of a mountain ~100m from the fields, and overlooking the eastern side of the famous Wular Lake. We believe that this rock carving depicts a meteorite impact that occurred some time between 40,000 BP and 6,000 BP (Vahia et al., 2006). It has already been observed that when it impacts a meteorite can reform the surface on which it lands. Such fractures can take the form of concentric rings around an impact crater. The impact of a massive meteorite or a small asteroid can also induce volcanic activity if the area it strikes contains hot lava that can rise up through the crust (Gibilisco, 2003). We believe that the astronomical interpretation of this stone carving is consistent with this interpretation because the carving has multiple concentric circles distributed across the entire picture (see Figure 2a and 2b). Vahia et al. (2006) have already postulated that a single meteoroid may have

splintered into several pieces as it penetrated the atmosphere and that if any of the larger bigger fragments landed they would have formed craters, pits or lakes.

There are four lakes in this region—corresponding to the four circles in the drawing—and several smaller water bodies, all consistent with a multiple impacts event. Also, the orientation of the rocks indicates that the meteoroid entered the region from the north-west and fell in a south-easterly direction. The three circles in Figure 2a are collinear and three of the lakes are also aligned in the same direction. In this scenario, Wular Lake (the largest in Asia) can be associated with the top-most circle; the second circle relates to Manasbal Lake; third circle to Dal Lake; and the fourth circle to Anchar Lake. The small circle between the two main circles corresponds to the small water bodies which exist between these lakes. We believe that the line emanating from the circles is an indication of the movement of the object, or a light streak, and the size of the circle is indicative of the brightness of the object. All this seems consistent with a meteorite impact. In order to examine this hypothesis, we examined the relevant geological literature and also carried out our own research around Dal Lake, and found the following evidence that, in our view, indicates a meteorite impact:

1. The original basin-like structure of Dal Lake, which since it formation has been deformed through erosion.
2. On coulomb excitations of different samples taken from Dal Lake we were able to find high concentration of 25 different elements, including platinum (34%), iron (91.7%), europium (52.2%) and many others typically associated with meteorite impacts.
3. Wadia (1953) reports evidence of shock metamorphism in the vicinity of Dal Lake.
4. Jeelani and Shah (2006) report the presence of basalts and breccias in the vicinity of Dal Lake.
5. The pH value of the water at a depth of 2m in the Lake, and from the surrounding mountains averages >9.7.

2.2 Burzuhama (Srinagar-Kashmir)

The site of Burzaham is located in the Kashmir Valley at 74°54′ longitude and +34°10′ latitude and 17km north-east of Srinagar. To its east is glaciated peak of Mahadev Mountain, while the glittering waters of Dal Lake lies to the south; there are also mountain ranges to then west. Among dozens of flat rectangular stones found at Burzaham are two bearing engravings. One of these has a base width of 70cm and contains a really impressive example of Neolithic art. The engraved portion is divided into two parts. The upper part shows an animal on the right and on the left depictions of two Suns, one with sixteen radiating lines while the other is slightly damaged. From Figure 3a it would seem that picture depicts a hunting scene, but Joglekar et al. (2006) postulate that this is not a terrestrial hunting scene but actually represents a sky map and the locations of prominent constellations and the Moon on the night when a supernova was observed (see Figure 3b). In this scenario, one of the hunters in the figure is Orion; the central animal is Taurus; the hunter on the right may have been formed from stars in Cetus; and the other animal on the right may be Andromeda and Pegasus.

On the basis of radiocarbon-dating, Agrawal and Kusumgar (1965) and Pande (1971) show that this site was utilized between 3,000 BC and 1,500 BC. A search of the literature revealed that there were only two possible supernovae during this period: HB9, which exploded in 5,700 BC and G182.4+4.3 which dates to around 1,800 BC. While the archaeological dating of the settlements at Burzaham does support G182.4+4.3, which reached an apparent magnitude of –7.21 at maximum, we believe that the object in the rock painting is more likely to be HB9. Shining at –9.6 apparent magnitude this would have been a very conspicuous object at maximum light (Damshek et al., 1978; Laehy and Aschenbach, 1995; Xu et al., 2005). If the position of HB9 is indicated by the concentric circles in the upper left part of Figure 3b, the Moon's position is marked by a larger concentric circles to the right, and the long curved line in the carving—traditionally interpreted as spear—is actually be an arc of bright stars, then this tallies with the figure on the left being Orion. To check on this, the relative distances of various stars in the rock engraving were compared with the actual angular separations of the stars in the sky, and there was a reasonable fit (Joglekar et al., 2006). On the basis of the accumulated evidence we believe that the rock engraving depicts a major astronomical event which took place more than 5,000 years ago.

In a recent study of this site we noted a number of additional points of interest:

1. Two of the stones are still *in situ* but are leaning (see Figure 4a) while the rest have fallen, but all can be categorised as 'megaliths'.
2. When all of the fallen and standing stones at this are considered together, they form a rough circle which may also have astronomical connotations.
3. There seems to be more to these monuments than local people attribute to them now. Of particular interest is a mound located due east of the stones.
4. Some of the stones seem to have been erected on artificially-constructed mounds, judging by the placement of rocks as a sort of retaining structure exposed in one of the excavations.
5. 'Cup marks', which are known to have astronomical connotations elsewhere (e.g. see Ruggles, 1999), were observed on two of the fallen stones.
6. A view of the eastern horizon is blocked to a large extent by mountains, but the western horizon is largely unobstructed.

2.3 Chillas and Dras [Drass?] (Ladakh)

Chillas is a small town located near the Dras [Drass?] belt of Ladakh region (India) but is under the occupation of Pakistan. It is located at 74° longitude and +35° latitude, on the upper reaches of the Indus River, under the shadow of the world-famous Nanga Parvat (Dhani, 1983). Archaeological surveys have revealed the existence of ~20,000 [50?] rock art sites and petroglyphs along the Karakorum Highway in north-ern areas of Pakistan, left by various invaders, traders and pilgrims who passed along this popular trade route. The earliest sites date between 5,000 and 1,000 BC, and include pictures of animals as well as

circular motifs. These latter carvings were pecked into the rock with stone tools, and some may have astronomical significance. Figures 5a and 5b show two different kinds of circular motifs, and as an initial interpretation we propose that they may represent the changing of the seasons, the calendar and radiating objects. Although it is too early to give the name of the event but such kinds of predictions become ultimately the future challenging problems. These interesting rock engravings clearly warrant further investigation.

3 CONCLUDING REMARKS

The overall investigations in this paper are summarized briefly as follows. Observation of the sky and astronomical bodies has been of worldwide interest since prehistoric times, irrespective of the culture involved. Kashmir, too, was an important place for celestial observations during the Paleolithic/Upper Paleolithic and Neolithic periods. In this paper we discussed the north-western part of Kashmir—an extreme region of the country—and drew the distinct impression that the ancient inhabitants definitely observed different celestial events, despite the fact that they were merely hunters and gatherers and could only use stone tools to record their observations. Two of the sites we discuss, Sopore and Burzuhama, have already attracted international attention because of their archaeoastronomical features, but some of the sites near Chillas also need to be carefully investigated from an archaeoastronomical point of view. Collectively, these Kashmir sites appear to depict meteorite impacts, a supernova, various constellations, and possibly the changing of the seasons. This north-western sector of Kashmir offers a route that was popular with ancestral travellers, and some of them made astronomical observations and left records of these in their rock art. Water would have been essential for the survival of these early 'astronomers', and when the various sites were studied in detail we noticed that all of them were situated on the banks of lakes, rivers or other bodies of water. Those sites that we have identified appear to provide a new perspective on the archaeoastronomical potential of Kashmir.

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Figure 1: Map of Jammu and Kashmir (India), showing the locations of different sites mentioned in the text.

Figure 2a: Stone carving located at Bomai Sopore in the Baramulla District of Kashmir.

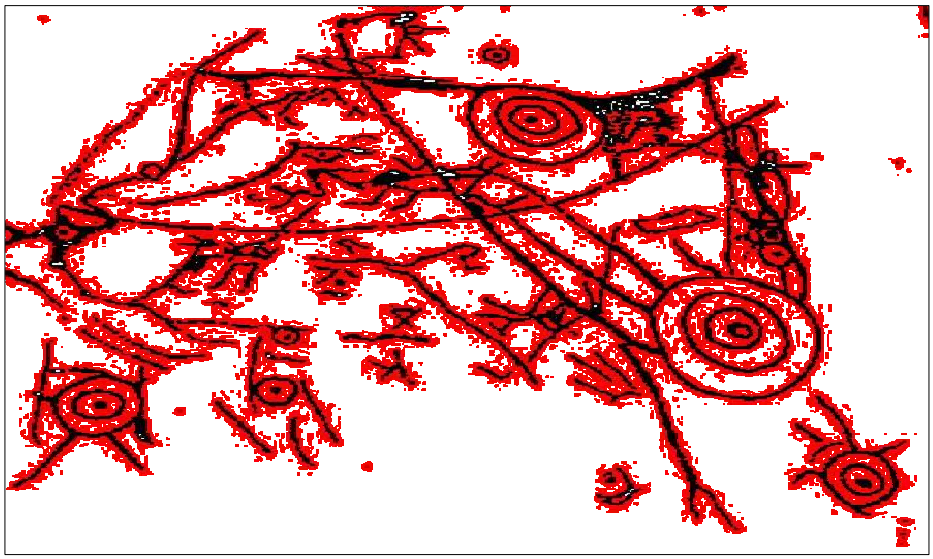

Figure 2b: Drawing showing the concentric circles of different sizes in Figure 2(a).

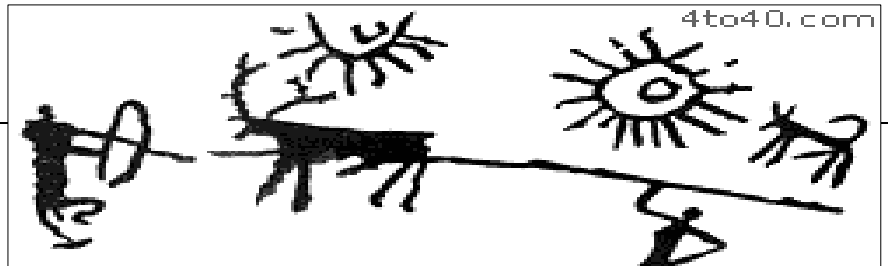

Figure 3a: Rock carving found at Burzuhama Kashm.

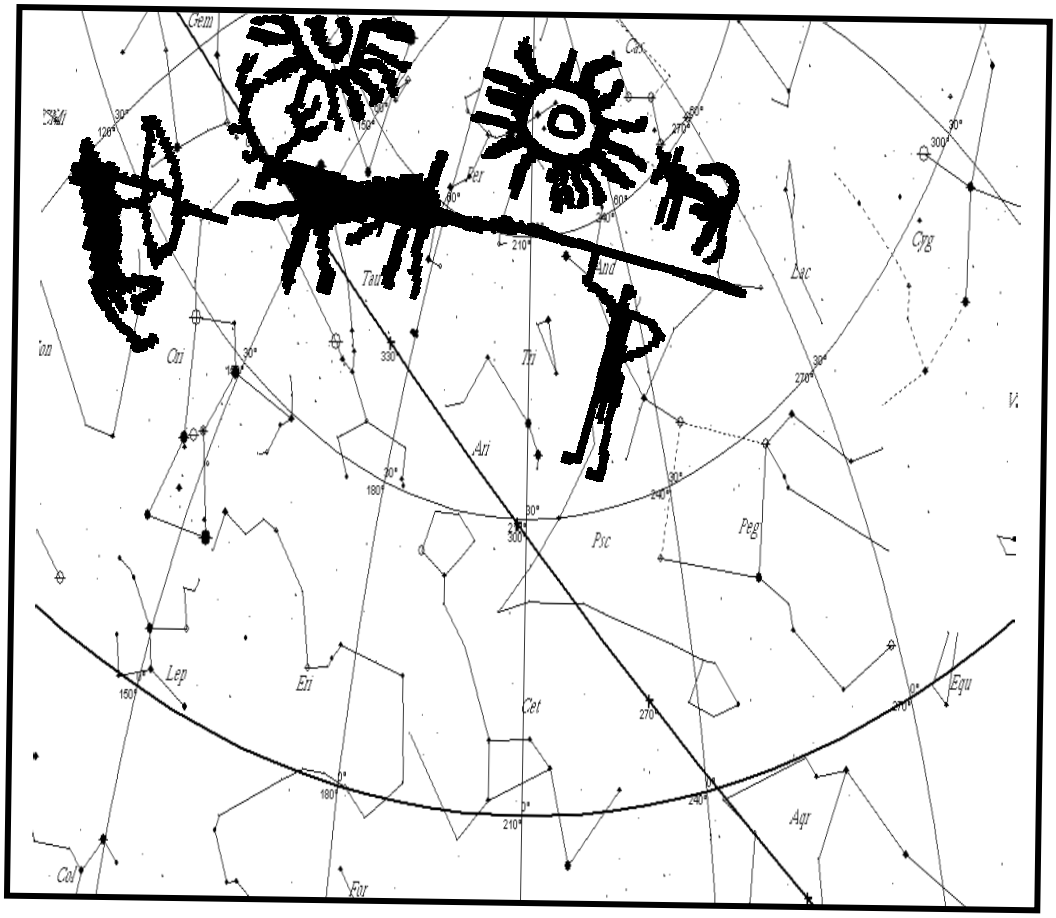

Figure 3b: Sky map of the region of HB9 in the sky chart for 5,700 BC. To facilitate easy comparison with the drawing, rough patterns are drawn in the map. The constellation names as per current identification are given. The big spot in the centre is the full moon in the month of August in roughly 5,700 BC, and the smaller spot on the right of Capella is the position of HB9.

Figure 4a: Panoramic view of the Burzuhama from the north-west.

Figu ture of Burzuhama.

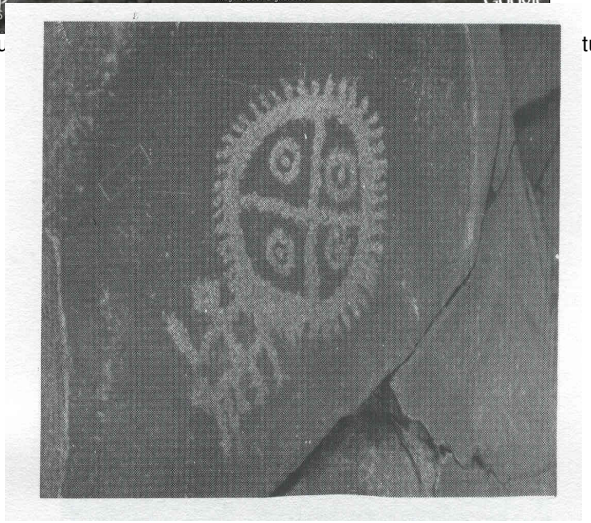

Figure 5(a): A horse rider pulling a circle showing four seasons.

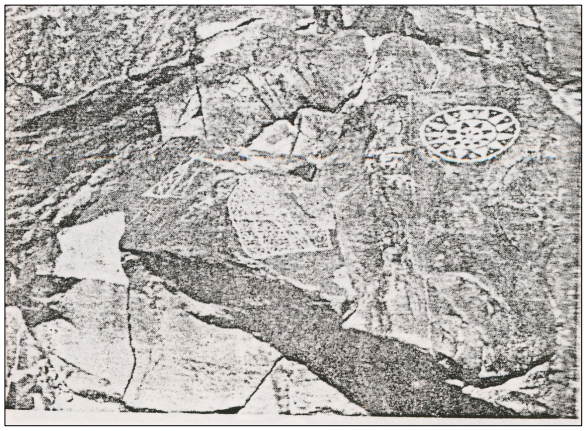

Figure 5b: Solar symbol that has in it 12 triangles possibly showing 12 months.